

## ABSTRACT

Methods and apparatus for storing and retrieving data using two-dimensional arrays.

In one implementation, a checkerboard buffer page system includes: a data source, providing data elements in a first order; a data destination, receiving data elements in a second order; memory devices having memory pages, data elements stored and retrieved in parallel to and from the memory devices; each buffer page having entries along a first dimension corresponding to the first order and along a second dimension corresponding to the second order, data elements stored in the first order and retrieved in the second order, at least one memory page stores data elements in multiple locations according to the first and second orders, at least two data elements consecutive in the first order are stored in parallel to the memory devices, and where at least two data elements consecutive in the second order are retrieved in parallel from the memories.